EduMat+

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GUIDELINES FOR THE USE OF STEAM AT SCHOOL

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By

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TARGET: preschool and primary teachers

In the context of school-age children's relationship with the use of communication technologies, it is important to reflect on the design of a digital educational protocol for teachers, centered on protecting the well-being of children using digital devices in a STEAM experiment and built around three basic dimensions:

1. **the body**, which invokes the concept of individual well-being, physical and virtual person, in a reassuring and protected real or online environment in which there are prerequisites for the development of the child's spatial-motor intelligence (Piaget, 1967). It is the task of the educator, in a digital education course with STEAMs aimed at children, to ensure digital use that does not compromise the development of the dimension of the "body" in the child, which is fundamental to his or her physical well-being in his or her primary socialization process.
2. **the mind**, which The "mind" refers to the psychological, cognitive and emotional well-being that the child must preserve by using technological devices.
3. **relationships,** which refer to the social well-being of the child and recall the relationships of interaction and relationship, which are fundamental to ensuring a progressive process of inclusion and integration of the child within the various daily contexts, each characterized by civic rules, more or less tacit, which contribute to the construction of that civic sense that will guide the behavior of tomorrow's citizen. Investing in the relationship also in a digital education path through STEAM means investing in the enhancement of that form of social intelligence, which begins to form in preschool age and can be compromised by a habit of using the device in isolation and solitude. In a preschool digital education perspective, the balanced relational dimension and the effective mediation of the educator become key levers for preserving the individual and social well-being of the child and ensuring a self-regulated and integrated use of the device, which is able to enhance exchange, sharing, and interaction with peers and with the educator, stimulating and realizing communication and collaboration in the performance of the child's daily activities

THE DIMENSION OF THE BODY

PRINCIPLES	ACTIONS
1. Taking care of the physical environment related to the play and learning space	The teacher must set up a physical learning space that is: • Attractive to the child and at the same time safe • Sober and essential, without distractions that can generate sources of visual, audio or tactil noise

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	hindering children's learning • Orderly, balanced in terms of content and objects (i.e., not too rich and not too sparse), but always stimulating and full of new activities and stimuli.
2. Nurturing the social environment, related to the relational climate built in the classroom during play, including with technologies. Indeed, providing a positive social environment helps to develop a sense of belonging and security for the child who feels he or she can freely express himself or herself and build spontaneous relationships with peers	the teacher must structure a social environment that is able to: • Foster the creation of loving, calm, stimulating and low-noise relationships among children and with teachers • Promote exchange, dialogue and collaboration among children at times of device use, such as through the construction of working groups to carry out activities Example — Robotics and Collaboration: Children work in small groups with simple programmable robots (e.g., Bee-Bots) to explore a floor map of their school or community. This fosters spatial reasoning, early mathematical skills, teamwork, and communication. • Promote the creation of a respectful, kind and collaborative climate • Teach children to always relate in a positive and courteous manner, through kindness, empathy and understanding
3. Nurturing the psychological environment through the provision of a loving, calm and stimulating social environment certainly makes it easier to ensure effective and rewarding learning, including with technology, by promoting concentration and reflection or independent learning, as well as serenity.	It is possible to build a psychological environment that can foster a child's emotional and cognitive well-being through the following actions: • Establish clear and shared rules • Assigning tasks that encourage creativity and divergent thinking • Assigning tasks with immediate feedback • Assigning tasks that are balanced against the child's abilities • Establish rewards that are not related to the grade but to the learning experience • Respect each child's learning time

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4. Promoting multi-sensory learning. Educational approaches/systems such as Montessori believed in learning through the stimulation of the 5 senses: hearing, seeing, manipulating, tasting and smelling. This implies integrating the use of technology in the classroom as an additional support to other educational tools, to be used in a coordinated and harmonious way to other classroom activities.	Use sensory and multimedia materials that, designed from an educational perspective, should: • Allow spontaneous repetition of activities • Facilitate sensory exploration and the use of hands • Make concrete what is abstract • Allow concentration • Create tasks with a precise objective and a clear deadline • Be aimed at the direct acquisition of technical skills • Focus attention on a dominant quality or skill so as not to generate confusion • Prepare materials that are beautiful and interesting to the child
5. Promoting experiential learning. The emphasis, therefore, is on doing, on the manipulation of objects at the basis of exploration of the world around us and, therefore, of knowledge (Fontana, 2023). Tactile experience and doing, alongside behavioral imitation processes, underlie the child's learning process, as argued by Jean Piaget (1967) and Dewey (Valle, 2017). Multisensoriality, stimulated by textual representation through digital, as well as the tactile manipulation of technologies (as, for example, in robotics and coding), can certainly stimulate the implementation of these two pedagogical principles even when using technologies for educational purposes Example — Unplugged and Multisensory Coding: Before using digital devices, children practice coding logic through unplugged activities, such as sequencing colored cards or physically enacting movement commands. These activities strengthen motor development, problem-	Always provide in the laboratory activities included in STEAM practical, concrete experiences related to the surrounding reality. These activities can be alternated with and linked to digital activities

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solving, and cognitive skills, providing a smooth transition to digital applications.	
6. The experiential and multisensory approach to learning is grounded in a pedagogical vision that places the child at the center—as an active, creative, and relational subject. Drawing on the foundational theories of Dewey, Piaget, Kolb, Montessori, Papert, and Bandura, and enriched by contemporary models such as Design Thinking and Constructionism, this approach promotes dynamic, inclusive, and project-based educational environments.Within this framework, direct experience, sensory engagement, the creation of meaningful artifacts, and peer collaboration serve as essential tools for fostering cognitive, emotional, and social development. **-Design Thinking** – A creative and iterative process that fosters empathy, ideation, prototyping, and testing **-Learning by Doing** – Rooted in the work of Dewey and Kolb, emphasizing hands-on experience and reflection **-Constructivism** – Based on Piaget's theory, highlighting active knowledge construction through interaction **-Social Learning** – From Bandura, focusing on learning through observation, imitation, and peer collaboration	Active learning through hands-on, tech-integrated, and creative experiences. Use Kolb's cycle, Design Thinking, and social collaboration. Personalize for inclusion and connect learning to real-world contexts. **Educational Technologies** Coding: Animated storytelling with Scratch Educational Robotics: Building and programming robots to solve problems Augmented Reality: Exploring historical or scientific environments via AR apps Digital Escape Room: Collaborative challenges with interactive quizzes and puzzles **Kolb's Experiential Learning Cycle.** Experience: Field trips or museum visits Reflection: Journaling, circle time, guided discussions Conceptualization: Creating concept maps and visual summaries Application: Final projects, presentations, prototypes **Design Thinking** Project Challenge: Classroom improvement challenge with brainstorming and prototyping Useful Object Creation: Making useful items (lamps, games, instruments) from recycled materials Visual Storytelling: Storyboards to narrate or solve problems School Hackathon: Team-based creative problem-solving events **Social Learning & Peer Mentoring** Peer Tutoring: Older students mentoring younger ones in reading or math Group Projects: Group projects with defined roles (leader, designer, reporter, etc.) Circle Time: Sharing emotions, ideas, and feedback Cooperative Games: Games to build empathy and

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	collaboration **Inclusion & Personalization** Tiered Activities: Scalable exercises with varying difficulty Multiple Options: Different ways to express learning (video, drawing, storytelling) Support Tools: Tools like maps, voice synthesis, and images Flexible Timing: Adjusted timeframes based on individual learning pace **Real-World Connections** Interdisciplinary Projects: For example, "Build a sustainable city" combining geography, science, and art External Collaborations: Partnerships with artisans, local organizations, and museums Expert Interviews: Conversations with parents, professionals, and volunteers Event Participation: Engagement in fairs, contests, and themed school days

THE DIMENSION OF THE MIND

PRINCIPLES	ACTIONS
1. the use of digital devices (e.g. misuse or excessive) can cause learning difficulties: hyperactivity, decline in attention and concentration, reflexive fragility, problems with language development, increased aggression and inability to self-regulate; The use of technologies offers, as well, multiple opportunities such as: the enhancement of emotional and imaginative intelligence that develop in preschool; the stimulation of expressive	• The teacher should not intervene by replacing the child but by being quietly present, limiting himself to the preparation of the environment and activities for the children to work on their own. • Instructional design is always calibrated with respect to the average cognitive domain of the class and respect for the class's learning time. The teacher must therefore self-regulate the use of technology by linking it to specific learning objectives to be achieved. In other words, The instructions

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language; the implementation of knowledge about oneself and the world around you. Example — Digital Storytelling: Pupils can do a simple science experiment, such as planting seeds, by taking photos, recording short descriptions, and arranging them into a digital picture book. This promotes observation, creativity, and language development through technology.	should be clear and concise related to the average knowledge level of the class and its learning pace.
2. Instructional methodologies of technology application are central to enhancing opportunities for learning of media use and reducing isolated, inactive and non-participatory forms for children	The adult instead of scolding the little one for making a mistake or substituting him or her in the performance of the task, must put him or her in a position to control the error and create a friendly relationship with it even through technology (Montessori, 2013). Working in pairs, in this case (or in small groups) is a good strategy for sharing formative actions, for mutual encouragement and support in the performance of activities, and for self-correction in case there should be errors during the performance of the task
3. The child learns by "trial and error," choosing on his or her own, autonomously, the actions to be taken in a learning journey. Error also has its formative value in this process Papert (1993). Making mistakes allows the child to explore and experiment with various solutions and to gain an awareness that there is no single method for solving problems, but that he or she can access different forms of intelligence and cognitive ability, through different modes of learning (Ferri, Mantovani, 2006). In practice, this means giving children the chance to try things out, make mistakes, and find their own solutions.	Encurage children to make choices and solve problems on their own, encouraging their desire for freedom and action including with robotics and STEAM. Planning pathways and actions for problem solving and reaching a goal are examples for such incentives towards independent problem solving
4. The use of technology makes it possible to accommodate the individual pace of learning for each child both by fostering	Do not replace the child in carrying out the task but "help the child do it himself." In this sense, the teacher assumes the role of facilitator, provides

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motivation and interest and by increasing the child's self-esteem, autonomy, and self-discipline along with problem-solving skills (Regni, Fogassi, 2019)	the teaching input and steps back to leave room for the student's creative ability to find the best solution on his or her own
5. Playful learning through play, including with technology is a central aspect of fostering children's cognitive and metacognitive implementation	The use of gamification in STEAM education has been shown to optimize student engagement and satisfaction within the classroom environment, despite the initial need for teacher training to adapt to this innovative methodology (Rodrigues-Silva & Alsina, 2023). The incorporation of game-based dynamics has also demonstrated a positive impact on academic performance, highlighting not only its potential to provide a playful alternative to traditional teaching methods, but also its value as a solid pedagogical approach to enhance learning outcomes across all levels of education (Hidalgo Puchaicela et al, 2025).

DIMENSION OF THE RELATIONSHIP

PRINCIPLES	ACTIONS
1. In early childhood, the emotional, cognitive, and physical mediation of the educator plays a central role: not only does it instill a sense of safety in the child, protecting them from emotions and situations perceived as critical or negative, but it also contributes to the development of self-awareness, personal recognition, and the construction of individual identity. This process is further reinforced by **Albert Bandura's Social Learning Theory**, which states that children learn not only through direct experience, but also by observing and imitating the behaviors, attitudes, and emotional responses of others. The educator thus becomes a key role model	The teacher supports the child through intentional and attentive interaction, offering input, active listening, and encouragement—especially during moments of difficulty. They monitor the child's activity even from a distance, guiding reflection on choices made and helping transform potential mistakes into learning opportunities.Acting as a consistent and conscious role model, the teacher promotes positive imitation and fosters a safe, welcoming relational climate. They encourage peer collaboration through group activities and mentoring, and adapt educational proposals to each child's learning pace and style, promoting inclusion and personalization.

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whose actions, language, and relational style actively influence the child's cognitive and social development.	
2. Consistent with the Montessori method, the role of the educator even with technology is to observe the child carefully, understand his interests, abilities and learning rhythms (Regni, Fogassi, 2019) and at the same time to guide, accompany, nurture his curiosity and to facilitate learning, so as to prepare situations capable of stimulating innate potential: the so-called internal capabilities of Nussbaum (2011).	The teacher must: • Observe the child, understand the child's abilities and accompany the child by providing a stimulating and safe environment for the child to express his or her potential.
3. The educator plays a facilitator role to the extent that he or she presents diverse materials and activities by calibrating children's interests and readiness and then stepping back and letting them explore independently, respecting their pace of learning.	The teacher must: • Facilitate learning by offering diversified activities • Use different tools, calibrating children's interests and curiosity and know when to step back and let them explore on their own • Explain how to use a material, without substituting the child, without rewards or punishments.
4. The educator acts as a mediator during conflicts through negotiation and mutual understanding, in this sense encouraging open dialogue, where children feel free to express their emotions. The method should promote empathy, cooperation, responsibility and respect for others and the environment even when using technology.	The teacher intervenes to mediate during conflicts that may arise between children and between children and teachers, encouraging dialogue and mutual understanding.
5. The method pushes children to care for the environment and interact with others in a respectful and kind manner.	The teacher teaches children: • to adhere to the rules of sharing the physical and social space of the school,

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	• to respect order: all objects used by children during educational play should be placed back where they were taken from, to allow others to play or work with them
6. Interaction with others should always be positive and courteous; we relate with kindness, empathy and understanding.	The teacher should be a source of inspiration and example for children, always acting with kindness and positivity
7. Adults respect children's emotions, offer empathic support and model emotion management skills.	The teacher should listen and stimulate the child to dialogue and share emotions and acquired information, as well as to communicate their learning experiences with the teacher and classmates

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